INTEGRATING RESILIENCE ACROSS THE ORGANIZATION

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PROJECT MOTIVATION

- $ROI = \dfrac{\Delta\, unit\ resilience\ *\ \beta(org|unit\ resilience)}{cost}$

- Organizations train units/teams to better achieve mission
  - Readiness – Is the organization prepared to achieve mission?
  - Resilience – Does the organization have the ability to plan for, absorb, recover, and adapt to threats to mission achievement
- Recent work emphasizes the importance of unit/team resilience (e.g., Cersovsky, 2011; Reivich et al., 2011)
  - Units/teams execute most tasks in today's workplace
  - For unit resilience training, the organizational readiness benefit(s) are not well understood
  - Study of unit resilience -> organizational readiness link can enable estimate of organizational readiness benefit from training

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OVERVIEW

- What is resilience?
- Current objectives
- Research questions
- Method (in-progress)
- Results (in-progress)
- Limitations
- Future work

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WHAT IS THIS THING CALLED RESILIENCE?

Philosophy of Science

Later efforts proliferate, expand, and build on common earlier work (Chalmers, 1999)

- **Induction** – construct theory, conduct research that proves theory
- **Falsification** – construct/identify theory, conduct research that identifies its boundaries/limitations
- **Bayesian** – assign a subjective probability *(belief)* to a position, develop evidence, update subjective probability
- **Paradigmatic Change** – paradigms frame theories, at some point ability of paradigm to continue to develop explanations (theories) of a phenomena diminishes, a new paradigm develops that captures old theories AND allows for development of new theories

Resilience

Current resilience research builds on a few common elements, but are stove piped

- **Ecology** – many stable states, a resilient system is able to reliably settle in a small number of stable states (Gunderson & Holling, 2002)
- **Engineering** – one preferred state, a resilient system returns to that state (Park et al., 2013)
- **Clinical Psychology** – resilience is the ability to return to some stable "healthy" state after adversity (Bonanno et al., 2010; Masten, 2001)
- **Communities** – "the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events" (Bakkensen et al., 2017; NAS, 2013)
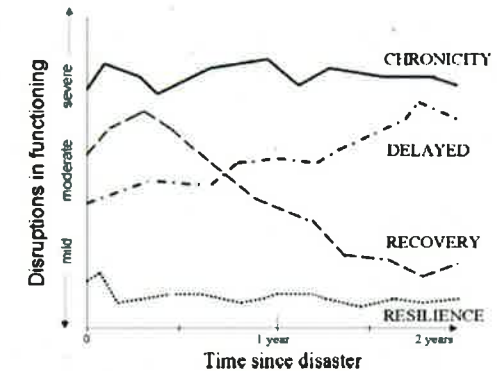
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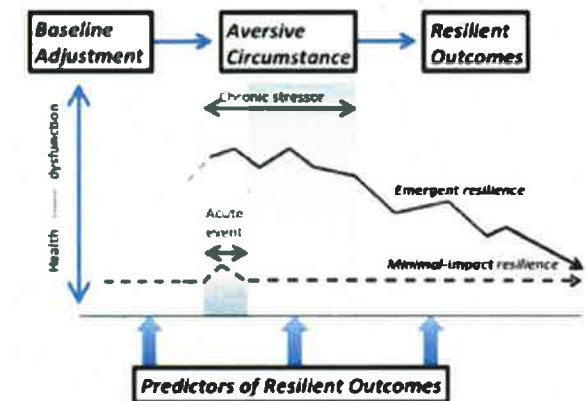
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RESILIENCE AND CRITICAL FUNCTION
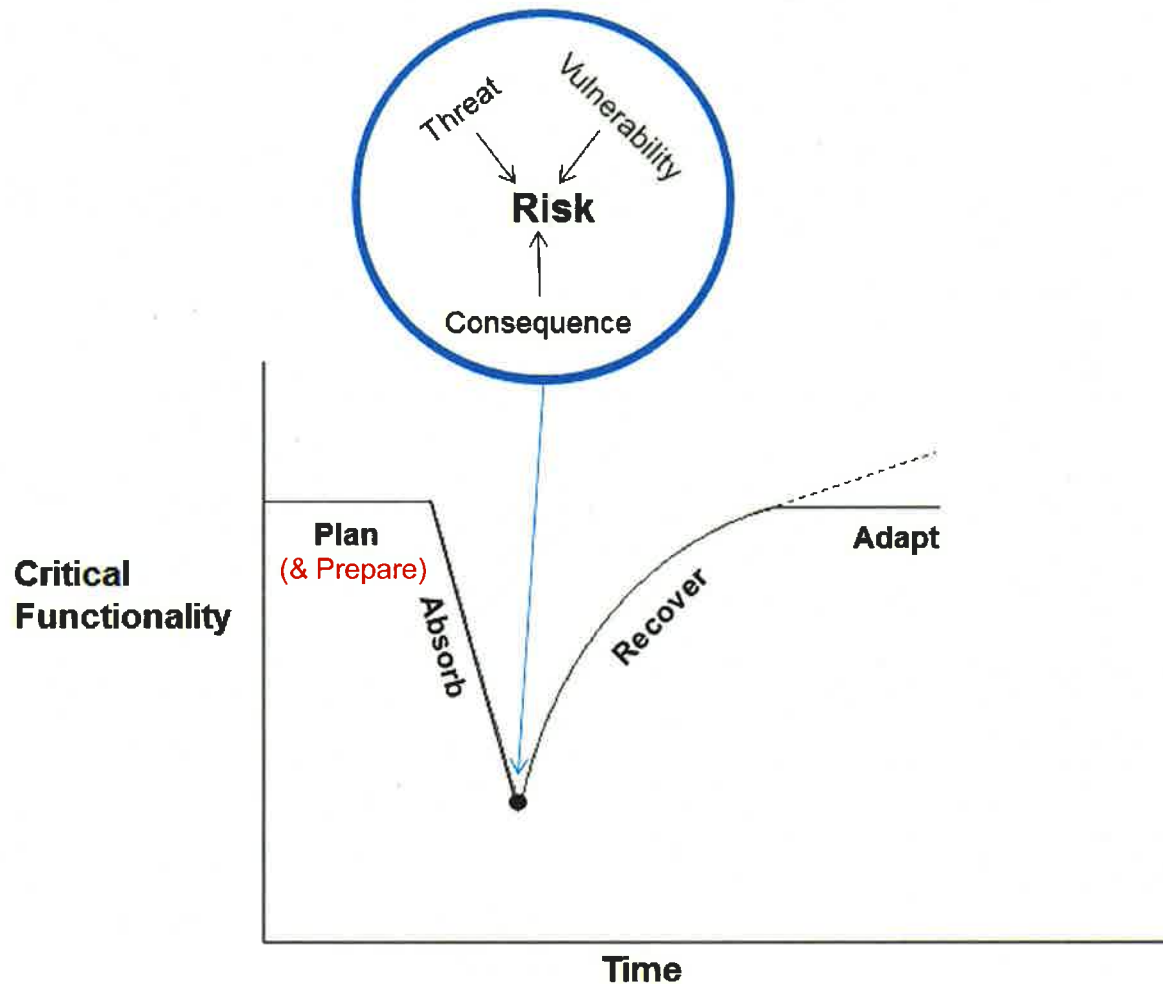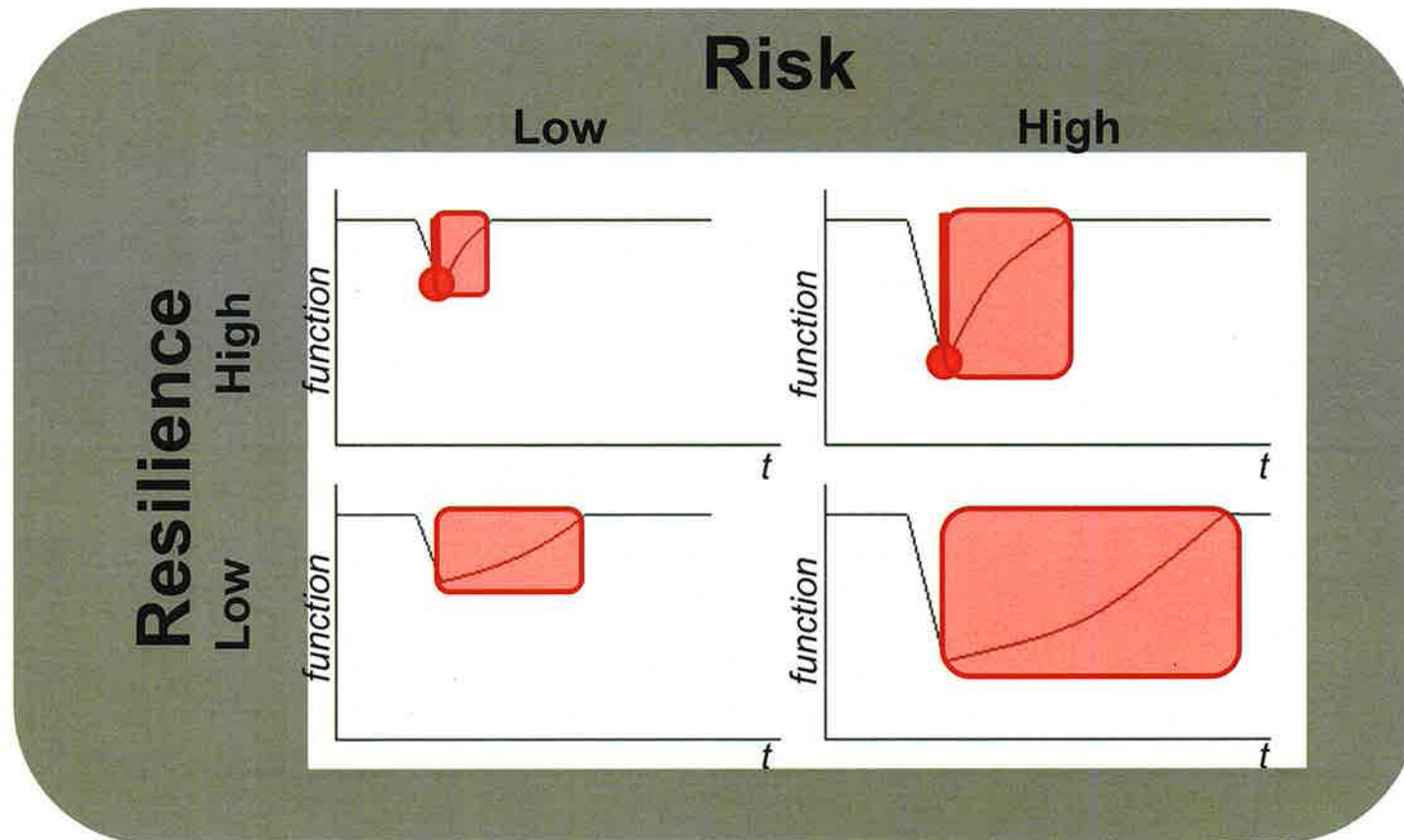

(Cato et al., in-prep; Linkov et al., 2014)

(Bonanno et al., 2010)

(Bonanno et al., 2015)

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RISK & RESILIENCE: VALUE OF RECOVERY

(Linkov et al., 2014)

OBJECTIVES OF THE CURRENT EFFORT

1) Seek knowledge and methods to measure unit resilience and its relationship with **Army mission readiness**, and **community resilience**. Understand what effects individual and unit resilience training efforts have on:

   a) the ability for the Army and DoD to achieve its mission **(Task 1)**

   b) the communities in which warfighters, their civilian support staff, and their families live and work (Task 2)

2) Initialize a framework that can be used to perform evidence-based evaluation of proposed enhancements or modifications to the Army resilience assessment and training pipeline (Task 3).

Work Group & Collective

Home Group & Collective

Unified Assessment Framework

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TASK 1 RESEARCH QUESTION #1

How should organizational readiness be conceived and defined in order to be independent of unit resilience and how would that impact the Army's conceptualization of readiness measures?

Organizational Readiness

- "The ability of military forces to fight and meet the demands of assigned missions (NAS, 2013; JP-1)."

Unit Readiness

- Extent to which both people and equipment (1) are available and appropriate for mission-essential tasks AND (2) are prepared to execute those tasks (JP-1; AR-220-1)

[Unit / Org / etc.] Resilience

- "…the ability [for unit / org / etc.] to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events (Cato et al., in-prep; Linkov et al., 2013)."

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TASK 1 RESEARCH QUESTION #2

In what ways does unit resilience enhance or inhibit U.S. Army / DoD mission readiness?

In what ways does mission readiness at the Army or DoD level enhance or inhibit unit resilience?

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METHOD: KEYWORD SEARCH

Databases

Database	Resources Searched
PsychNET	PsychINFO, PsycBOOKS, PsycCRITQUES, PsycARTICLES, PsycEXTRA
Web of Science Core Collection	Science Citation Index Expanded, Social Sciences Citation Index, Conference Proceedings Citation Index – Science, Conference Proceedings Citation Index – Social Science & Humanities, Book Citation Index – Science, Book Citation Index – Social Sciences & Humanities, Emerging Sources Citation Index, Current Chemical Reactions, Index Chemicus
EBSCOhost	Business Source Complete (2250+ journals and magazines)

Key terms & Justification

Search Term	Justification
unit resilien* AND (military OR war OR combat)	should give results related to unit resilience in the military.
resilien* AND military personnel	will find articles about military personnel and resilience, despite the fact that the articles might not directly refer to unit resilience.
organization* readiness and (unit OR team)	find literature on organizational readiness that also delves into smaller units or teams.
hardiness AND (unit OR team)	Flexibility is considered a trait contributing to resilience, and is often used as a measure for resilience (Reivich et al. 2011, Grzywacz et al 2007). This term will give a broader yet highly related set of search results.
flexib* AND readiness AND (unit OR group OR team)	Hardiness was included in the search terms as dispositional resilience scales have been used for measuring hardiness (Hystad et al 2010). This term will give a broader yet highly related set of search results.

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METHOD: FORWARD SEARCH & INCLUSION CRITERIA

Forward Search Articles

Horne, J. F. & Orr, J. E. (1998). Assessing behaviors that create resilient organizations.

Meneghel, I., Salanova, M., & Martinez, I. M. (2016). Feeling good makes us stronger: How team resilience mediates the effect of positive emotions on team performance.

Somers, S. (2009). Measuring resilience potential: An adaptive strategy for organizational crisis planning.

West, B. J., Patera, J. L., & Carsten, M. K. (2009). Team level positivity: Investigating positive psychological capacities and team level outcomes.

Adler et al. (2009). Battlemind Debriefing and Battlemind Training as Early Interventions With Soldiers Returning From Iraq: Randomization by Platoon

Article Inclusion Criteria

	Inclusion Criteria	Exclusion Criteria
Study Design	Meta-analyses Systematic reviews Studies/trials Qualitative studies	Theoretical papers Methodological papers
Population	Groups Teams Units Organizations	Individuals Families
Intervention	Any specifically resilience-based intervention, including intentional and naturally occurring interventions	Non-resilience interventions or measures
Outcomes	Resilience Readiness	Psychopathy (i.e. PTSD) Physical health/fitness Addiction

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RESULTS: CORPUS SUMMARY

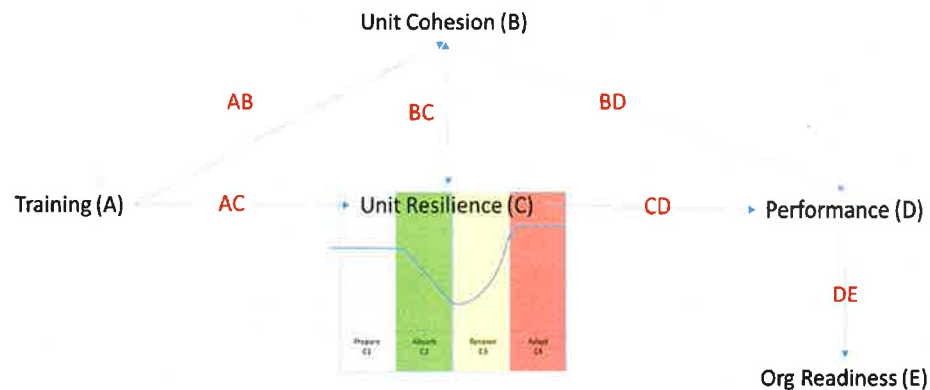- 37 papers
- Population
  - primarily military, mostly male & early 20's
  - measures often taken post-deployment
- Study Design
  - Intervention studies
    - i.e., mindfulness training, stress debriefing
  - Correlational studies
    - i.e., relationship of unit cohesion & resilience measures
- Themes
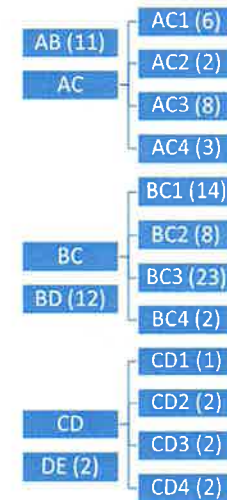 - Many studies examine unit cohesion or unit support

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EFFECTS MODEL

Link Counts

Training (A) — AB — AC — Unit Resilience (C) — CD — Performance (D)

Unit Cohesion (B)

BC — BD

DE

Org Readiness (E)

AB (11)		
AC	AC1 (6)	
	AC2 (2)	
	AC3 (8)	
	AC4 (3)	
BC	BC1 (14)	
	BC2 (8)	
	BC3 (23)	
BD (12)	BC4 (2)	
CD	CD1 (1)	
	CD2 (2)	
	CD3 (2)	
DE (2)	CD4 (2)	

Node	Definition	Example Variables Used
A. Training	Any intervention intended to increase resilience in the population.	Group Therapy; Mindfulness Training; Stress Inoculation; Debriefing
B. Unit Cohesion	Sense of shared unit identity and mission space, or a sense of comradery and belonging.	Group Cohesion; Unit Support; Social Support; Coordination
C1. Unit Resilience-Prepare	Building and maintaining the resources to be ready for future missions.	Readiness; Health; Group Combat Readiness; Mental Preparation
C2. Unit Resilience-Absorb	Continued critical functioning under stressful conditions.	Resilience; Team Resilience; Hardiness
C3. Unit Resilience-Recover	Regaining loss in functioning after stressful conditions.	Stress; PTSD; Coping; Psychological Distress; PTSS
C4. Unit Resilience-Adapt	Learning and improving readiness from past experiences.	PTG; Adaptability; Cognitive Flexibility
D. Performance	A measure that describes the action or process of carrying out or accomplishing an action, task, or function.	Team Performance; In-Role Performance; Organizational Citizenship Behavior
E. Organizational Readiness	The ability of an organization to meet the demands of a dynamically changing environment by constantly creating and recombining resources to in novel ways	Operational Readiness; Readiness for Change

CHALLENGES & CAVEATS

- Limited number of papers

- Few group measures, reliance on individual data

- Wide variety of measurement tools, intervention types, study designs
    - No consistent theory/definition of unit (team) resilience THEREFORE
    - No consistent/stable measurement construct for unit/team resilience

- Adaptation Alone ≠ Resilience (Flynn & Burke, 2011)
    - Adaptation is necessary, but not sufficient
    - Ability to perform well for the other phases of the threat event cycle is also required

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FUTURE PLANNED WORK

Assess effect of unit resilience training on community & family resilience/readiness.

Develop framework to perform evidence-based evaluation of proposed enhancements/modifications to U.S. Army resilience assessment and training pipeline.

Connect to holistic measurement frameworks to compare the value of training (or other) resilience interventions across many components of the organization.

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Resilience Matrix

System Domains
- Physical
- Information
- Cognitive
- Social

Disruptive Event Stages
- PREPARE
- ABSORB
- RECOVER
- ADAPT

Scale

Home — Neighborhood — Town — County — Region — State — Country
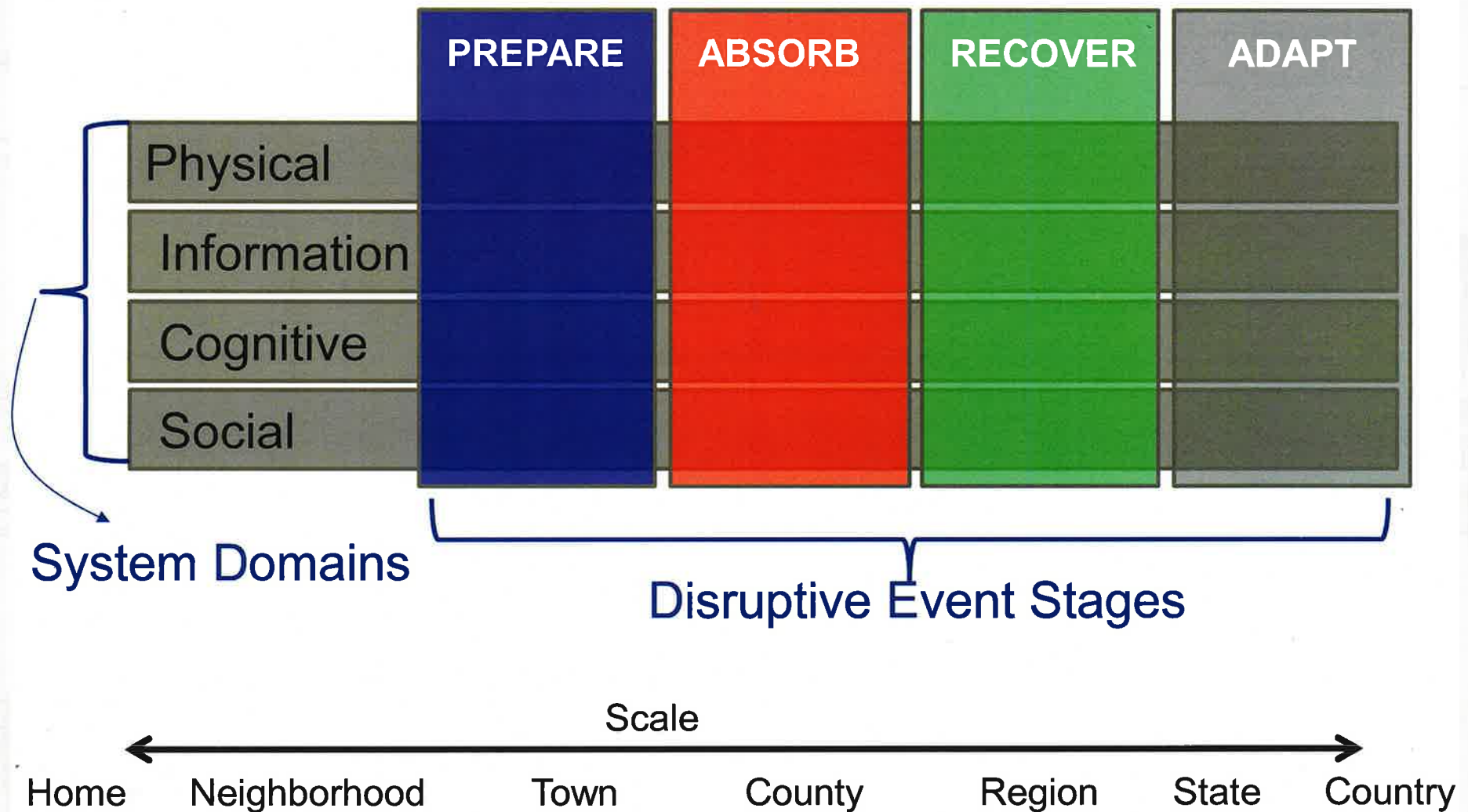
(Alberts & Hayes, 2003; Linkov et al., 2013; NAS, 2013)

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COMPLETED MATRIX EXAMPLE

Adverse Event

Time →

Previous Cycle	Plan/Prepare	Absorb	Recover	Adapt
Physical	State and capability of equipment and personnel, network structure	Event recognition and system performance to maintain function	System changes to recover previous functionality	Changes to improve system resilience
Information	Data preparation, presentation, analysis, and storage	Real-time assessment of functionality, anticipation of cascading losses and event closure	Data use to track recovery progress and anticipate recovery scenarios	Creation and improvement of data storage and use protocols
Cognitive	System design and operation decisions, with anticipation of adverse events	Contingency protocols and proactive event management	Recovery decision-making and communication	Design of new system configurations, objectives, and decision criteria
Social	Social network, social capital, institutional and cultural norms, and training	Resourceful and accessible personnel and social institutions for event response	Teamwork and knowledge sharing to enhance system recovery	Addition of or changes to institutions, policies, training programs, and culture

(Linkov et al., 2013)

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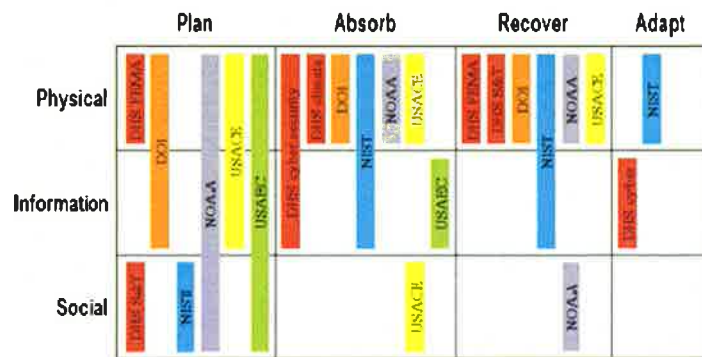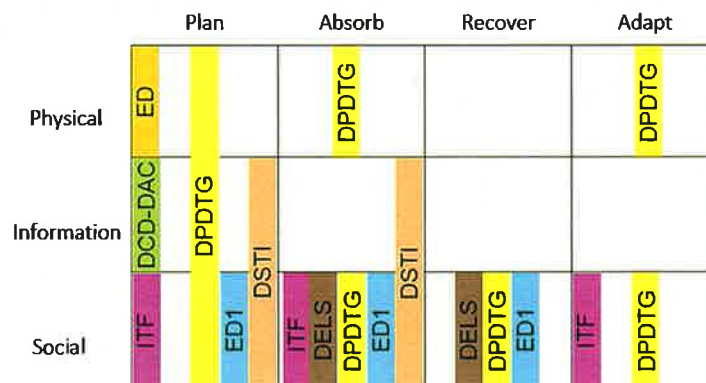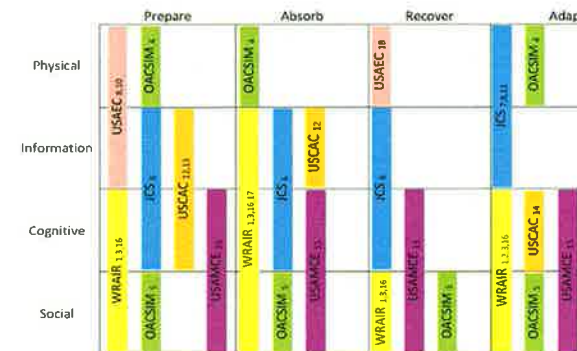**U.S. ARMY**

CROSS-SYSTEM MEASUREMENT

Resilience initiatives can be compared across subcomponents for qualitative insights or quantitative assessment

(Larkin et al, 2015)

(Wood et al, in-review)

(Linkov, 2017)

	JCS	ACSIM	USAEC	CAC	WRAIR	USAMCE
JCS	1	0.13	0.20	0.53	0.38	0.38
ACSIM	0.13	1	0.22	0.00	0.53	0.53
USAEC	0.20	0.22	1.00	0.29	0	0
CAC	0.53	0	0.29	1.00	0.53	0.35
WRAIR	0.38	0.53	0.00	0.53	1	0.88
USAMCE	0.38	0.53	0.00	0.35	0.88	1

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QUESTIONS?

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SUPPLEMENTAL SLIDES

LITERATURE REVIEW SCREENING PLAN

2,358 citations → Removed Duplication → 387 Removed
1971 citations → High-Level Screening: Relevance check → 642 Removed
1,329 citations → High-Level Screening: SPIO Criteria → TBD
TBD citations → Low-Level Screening: Tagging (Vanhove et al. 2015) & SPIO Confirmation → TBD
TBD citations
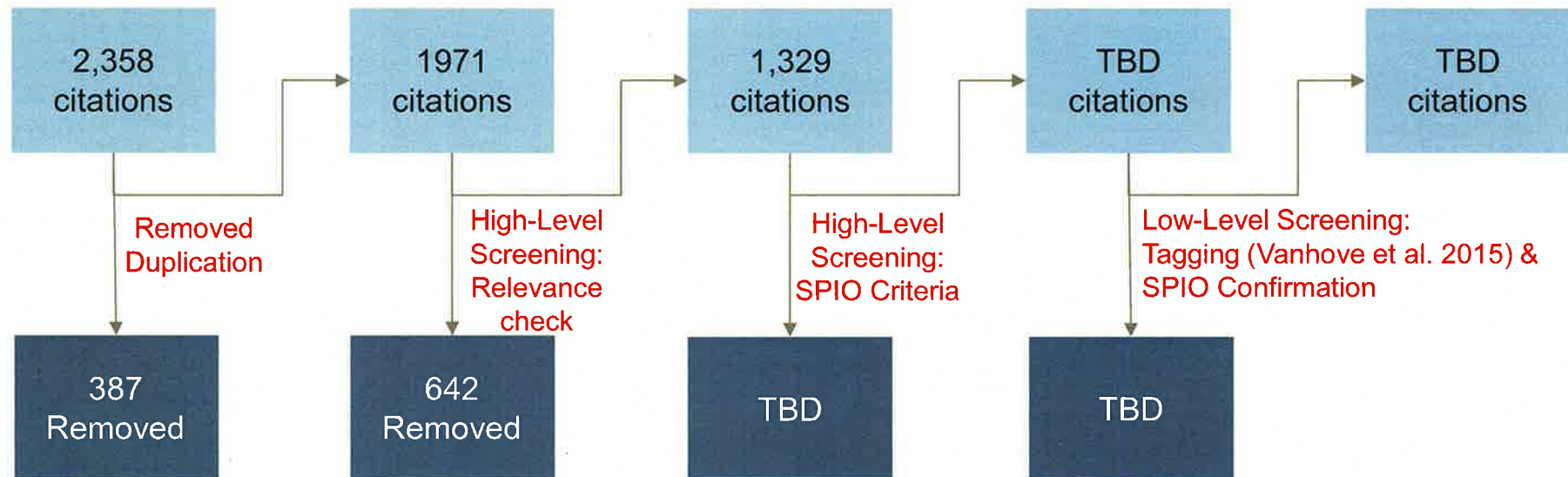
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LOW-LEVEL TAGGING (VANHOVE ET AL. 2015)

Table 2. Results of categorical moderator analyses conducted among proximal effects

	k	n	d	Lower 95% CI	Upper 95% CI
Programme sample					
Universal	23	3,723	0.29	0.18	0.40
Targeted	6	940	0.09	−0.11	0.28
Occupational setting					
Non-military	20	1,961	0.26	0.12	0.41
Military	9	2,701	0.25	0.09	0.41
Form of delivery					
One-on-one	3	100	0.59	0.23	0.95
Group-based classroom	21	3,801	0.25	0.12	0.37
Computer-based	4	465	0.16	−0.08	0.39
Train-the-trainer	1	297	0.16	−0.07	0.39
Study design					
Between-participants	22	4,147	0.15	0.07	0.24
Within-participants	7	515	0.49	0.35	0.63
Comparison group					
Non-intervention	17	3,438	0.18	0.09	0.26
Active comparison	5	710	0.09	−0.16	0.33
Participant assignment					
Non-random	10	3,041	0.18	0.04	0.31
Random	12	1,107	0.12	0.00	0.24

Are there other criteria we should consider?
Are any of these criteria not relevant to our research questions?

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GANTT CHART

Task	FY17			FY18				FY19
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
1) Organizational readiness review	██	██	██	██				
2) Community resilience review			██	██	██			
3) Decision model approach					██	██	██	██

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OPERATIONAL DEFINITIONS: UNITS OF ANALYSIS

Team (or Unit)
- Two or more individuals who must interact cooperatively and adaptively in pursuit of shared valued objectives (Dyer, 1984; Cannon-Bowers, Salas, & Converse, 1993)

Organization
- TBD
- Min/max size, functionality, etc.?

Family
- TBD
- Household, kinship, etc.?

Community
- TBD
- Administrative unit, proximity to installation, location of residence for warfighters/employees?

Organization Community

Unit Family

Warfighter

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Data extraction

We developed a data extraction tool, which was adapted from a previous systematic review (viz. Simpson *et al.*, 2014). The data extracted included information on study design and methodology, the populations under review, the interventions being employed, and the outcomes reported in each trial. Four reviewers working indepen-

Table 1. SPIO narrow screen inclusion and exclusion criteria

	Inclusion criteria	Exclusion criteria
Study design	Randomized controlled trial, controlled trial, trial	Qualitative studies, single case studies, systematic review, literature review, methodological papers
Population	Adults (>18 years) and any working (employee) samples	<18 years and non-work samples
Intervention	Any specifically resilience-based intervention	Non-resilience interventions
Outcomes	Resilience and any mental health, well-being, physical, biological, psychosocial, and performance outcomes	

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REPORT DOCUMENTATION PAGE

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	5c. PROGRAM ELEMENT NUMBER	N/A

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13. SUPPLEMENTARY NOTES
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14. ABSTRACT
For organizations to be ready and resilient, they need to understand how attempts to improve the organization through training or other tools at one level of organizational structure (i.e., individuals, groups) impact other levels of the organization. An inherent assumption of individual resilience training programs is that improvement in individual resilience skills will result in units that are better equipped to address adversity. Hypothesized effects of improved unit resilience include improvements in organizational mission readiness and enhanced community resilience. Research is presented on understanding the relationships between individual and unit-level resilience via a systematic literature review and a meta-analysis. The research providing mechanistic accounts of relationships between unit resilience and organizational readiness or community resilience as it relates to large organizations like the U.S. Army is not well understood. Measurement constructs, to the extent that they exist, are needed to understand the relationship between unit resilience and both organizational readiness and community resilience.

15. SUBJECT TERMS

Resilience, organizations, training, unit resilience, readiness

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Colanda R. Cato, Ph.D.
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